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By-Lewis, B.T.

Managing the Small Ticket Job (Up to 8 Manhours).

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This presentation is concerned with maintenance management and operational cost control techniques. Various sources of inefficiency concerning maintenance operations are analyzed, and consideration is given to the following aspects of the development of a controlled maintenance system: control over work input, the use of planning and estimating, the use of standard time data, the use of production control techniques, and the comparison of actual repair hours to planned labor hours. Audience reactions to the presentation are included. (FS)

THURSDAY, MAY 4th 1967. - 11:20 a.m.
Mount Royal Hotel, Champlain Hall.

CHAIRMAN: MR. J. K. Armour, York University.

"MANAGING THE SMALL TICKET JOB (Up to 8 Manhours".)
By Mr. B. T. Lewis, Management Consultant.

MR. ARMOUR: I would like to ask Mr. Welanetz, of Williams College, to introduce our next speaker.

MR. WELENETZ: I would like to introduce another interesting theme. First, the topic, "Managing the Small Ticket Job - up to 8 manhours". This is a subject which will be interesting to all of you because most of us spend the majority of our time doing just that.

Secondly, the man. Our speaker, Mr. B.T. Lewis, comes to us very well qualified. He is a management consultant and a registered professional engineer.

Alltogether I think our speaker has a lot of valuable information for you.

MR. LEWIS: I would like to say that I am very happy to be here. I am going to talk to you as an industrial engineer. My talk will be impromptu and nothing at all like the written material I submitted to your committee.

IMPROMPTU LECTURE, By Mr. B.T. Lewis.
(For submitted text, see further.)

Nevertheless I am going to talk to you about a very important part of your job, the management of your resources, that is labour and material that you have on hand.

Now the theme of my discussion will be maintenance, the small time and large time job, chiefly the small time. My experience, over the last few years, has shown that this cost on your university has been rising at an approximate rate of 5% per year due to the fact that you have had to pay your men more which was due to increased cost caused by union negotiations. Your suppliers have charged you more for materials and the sum total of this, plus the fact that your physical plant is larger and your university is growing, all of which adds up to a 5% increase.

Against that, you will find that the resources you have in hand have remained about the same or slightly more, unless your university controller give you all the money you ask for at budget time.

So you are forced to make do with what you have and I call the make do, the difference between the needs and the resources, the necessity of essential maintenance. Work should be done and cannot be done for a year because of lack of manpower or money. I can give you a couple of rules. One is that on a theoretical basis the gap between the needs and resources should be about one-quarter of one percent of the current plant value. The current plant value is what it would cost you to-day to replace your structures and your equipment, including T.V. equipment. As a practical means if you cannot succeed in drawing the gap down to 2 percent you will be doing well.

Now, one of the easiest ways is to obtain more productivity from your maintenance men. I have found that without much bother you can double the output of your men with just a little better management. I am talking about the basis of three component parts, the work form, the schedule programme and the management report. With these three basic components you can double your productivity of your maintenance force and can obtain double the amount of work for the same amount of money.

There is an industrial engineering technique called "Work symbol". This is a statistical technique wherein the industrial engineer determines what your men are doing throughout a normal work day. I have found in working in many government installations, industrial plants, but I have had little experience in universities, that the productivity level of your men if there is no management control sometimes runs about 30% less without the system.

I call my system "Control over maintenance". Out of the 8 hour-day you can rest assured that you are getting approximately 3 effective hours per day. What is happening to the hours of the day for which you are paying this man 8 hours of pay? It is called "unavoidable delays." I call it "goof off" time. It is time when perhaps you or your supervisor do not have time to go out and see what is being done.

There are many reasons and occasions for true unavoidable delays in maintenance work and they are tied up with what I call "lack of". These lack ofs are what is costing you the extra 30 or 40 percent productivity. I say to you that you can obtain an increase from your personnel from about 30% to about 60% by paying attention as managers to these "lack ofs".

First, the "lack of" material is one. If you schedule a job and the material is not quite completely there you can be sure that

there is going to be lost time while the men are waiting, or going back to the stores, or just fooling around. The "lack of" transportation - if you schedule your people to go to a job site and they do not have their transportation at the time you want it, there is going to be delays. "Lack of" assisted trade, if the trade work is prepared on the site the others will stand around and look on. And the "lack of" equipment, which is obvious, and one other - the "lack of" the job site. Howmany times have you scheduled men into a job site area and found it unavailable.

So, if you just pay attention to my system and you minimize these five "lack ofs", I can guarantee that you will double your productivity from your maintenance output at little extra cost.

This is the latest maintenance management programme, but this is rather entensive to talk to you in a short period of time. In the last few years I have extended this to five phases, but what I am talking to you about to-day is simply phase 1. I have made a study and analysis of universities and schools and I have found that of all the work tickets that you process across your desk, generally speaking 80% of them are less than a man-hour. In the greater number of these jobs plaguing you, you should pay more attention to reducing the flow involved. These controlled maintenance procedures is where you can increase up to 30 or 40% in your productivity.

Another thing I have noticed. I find that, generally speaking, an over-worked Physical Plant Administrator who does not have time to manage because he is burdened so heavily with the pressure of day to day operation. You will not gain control of the work and increase the productivity unless you gain control over the work input. If you do not go from an unplanned condition of management to one of planned maintenance it follow that you are going to continue to achieve about a 30% productivity level. So to do this your Physical Plant Administrator must assign someone to a control job. You are going to think about putting someone on a full time basis, or more than one, to a job title where he will be ready to plan an estimate jobs, to schedule jobs, to write a management report for you, who can have control over your work team. There is a title called Planner Estimator, Technical Supply and also Work Manager.

The Planner Estimator will have to be technically trained, preferably a non engineer. The work management part of the job assume you would obtain free standard time data from an outside source. The U.S. Navy have a standard check-up book, which is widely used. It would be very worthwhile. You get already worked-up standard time date, specifically developed for maintenance work. In an industrial concern, this data will provide you with about 25 or 30% of the craft coverage needed. But I would say that a university, which is very similar to a naval shore station, would probably get about 50% craft coverage because it is made up of instructor's rates, crafts, base control, electrical and mechanical equipment. This is something worth looking into.

The man who would apply this data, on the small ticket jobs as well as the large ticket jobs, is the Planner Estimator. I would suggest that for every 25-30 men in your work force, that you provide a Planner Estimator. Another way to have control over 50 to 100 men you should have a Scheduler on a full time basis. So these men, the Scheduler and the Planner Estimator, are put into your organization to help the Physical Plant Administrator to do a better job, but the main key to the whole business is the line foreman.

I can say that the reason, why you are probably getting less effective production on maintenance works, is the fact that the foremen are not doing their job. I have found a basic axiom that U.S. and Canadian craftsmen will give you a fair day's work for a fair day's pay provided you, as management, will allow them to do so. And the road block that you put in the way are the "lack ofs" I mentioned. It is not through design, but is there a lack of management ability in co-ordination.

Now, what about Foremen? If the foreman is burdened down with other duties such as planning and budget, requisitioning and sundry matters, co-ordinating with other trades, preparing personnel reports, preparing production reports, how can he be out and about in the field seeing this his men are doing the job that they should be doing? If the foreman is not out supervising his craftsmen he cannot do his job, and his job is the obtaining of quality and quantity in maintenance work. You have got to get the foreman away from his desk at least 50% of the time and into the field seeing that the men are doing their job.

Now we come to preventive maintenance inception. This is the way you get a hold on work input. If you can get your P.M.I. and work effectively to produce at least 60% of your work load, the small job and the larger job, then you will be able to gain control over what is going on in the department. You go from un-planed to planned maintenance with no problem. Plan and estimate. See that customers' work requests are converted to a work area.

Get the E.P.S., or get some industrial engineer to work up a set up of standard time date.

Shop Schedule - here is where you are making your money, when you reduce loss time in there, you find the men works harder. Remove the obstacles from the men so that you can give them an opportunity to return to the 60 or 70% of the work day. In an 8 hour work day you should be getting $6\frac{1}{2}$ effective craft hours, leaving $1\frac{1}{2}$ hours for other things.

Management Reports - you should get something on a day or work order basis. You should work out with your controller standing work orders. So that you have some return of labour by costs on the larger jobs and by total expenditure on the smaller jobs.

E.P.S. which is the second phase of my programme.

Now the estimate planner standard is the number of hours calculated by technicians for a qualified worker working with average energy to accomplish a defined amount of work.

In maintenance work, as I see it from a management and cost accounting viewpoint, a maintenance job has four component parts. You have the actual work time, then you have the "add ons", the travel time, the number of round trips required for each man on a per day basis to complete the job. You have the preparation time, the time required to make ready at the shops. at the site and the reverse when you finish, put away on the site and put away at the shops, and the delays. There are several categories of delays. I have touched on one but there are also unavoidable delays, there are planning delays. The men still have to plan how to do the job at the site. When there is more than one man on the job there is going to be lost time. And there are personal delays, the smoking, the talking, etc. This can usually mean a large block of time if you do not control it.

So the sum total of craft time, traval time preparation time and delay time is a true picture of a particular maintenance job from a cost viewpoint. If a job is 8 hours rated time, 6½ hours should be devoted to craft work.

I will tell you something that will save you the expenses of coming here. If you just pay attention, if you just concern yourself with controlling the time your men return for lunch and for quitting time, I can guarantee you that you will save a half-hour per man per day. I have not met a problem that cannot be controlled somewhere. If you took one man and paid him $10,000. just to concentrate on that particular area, he would return you $30,000. in extra productivity.

Now the E.P.S. data are the developing of industrial techniques, time studies, work plans for a qualified worker who works an average flow.

Now before we progress here, let us talk about the small ticket job in the concept of what I have been discussing so far. What can you do to control a small ticket job? Let us take a job where you have a trouble call, somebody calls and says "my light bulb is out". Do you immediately drop everything and rush to attend to it? The biggest thing, you have to contend with, is the small ticket job. It could be given two names; it is either an emergency job, or a service job. The definition of "emergency" should be something that would affect the mission of the school, which is teaching. And that would be something to do with the utility lines, electricity or heat. So you got to have someone on the telephone who can screen the calls. And this should not be the foreman; it should be a lower accredited person who has enough initiative to decide whether it is "emergency" or "service". An emergency job should be finished within four hours of receipt.

The service job is where you get the problem. If you have enough men to take care of every small ticket job in the same day, you would be over-staffed. A normal backlog in service tickets should be around 2 to 5 days. In other words, you should have enough service tickets on hand to occupy the men for 2 to 5 days.

Once you have classified a job as "service", you can then put it through your system. You can have the work ticket written up, you can have an estimator look up how long the job should take before it is done, fix a planned number of man-hours and give it to the foreman before he despatches the men. In this manner foremen can properly schedule such jobs. If a man puts in time more than the rate time, then we in the management school call for rate investigation and the taking of corrective management action.

The use of standard time date, the use in control system is no better or will produce no result unless you, as managers, take steps to do something about variations from a pre-determined norm. As administrators it is your job to see that your people working on these jobs work to a norm and, if they do not meet the norm, they should explain why.

In summary the controlled maintenance system is one that provides control over money, materials and power through better maintenance inception, through planning and estimating to give you directive for man and materials, and scheduling jobs to provide you with a minimum of lost time.

So total control in your department will proceed from control over work input, from the use of planning and estimating, the use of standard time data, the use of production control techniques, the comparison of actual repair hours to planned labour hours, so that you can get cost reports, cost accounting and cost analysis. The cost reports are the necessary corrective management action to show that the plans that are made are brought back into function.

I shall be glad to answer questions.

MR: WEBER, UNIVERSITY OF MARYLAND: I am wondering if, in the organization operation that you describe, you have variable in personnel standards, some measure of people management?

MR: LEWIS: I wrote an article on this in 1963. I have worked on a formula that deal with this.

MR: WEBER: You gave 25% of the total replacement of plant - is that right? How do you define the cost, do you calculate everything?

MR. LEWIS: It is the structures and equipment. One of the biggest problems where Physical Plant Administrators do not have a handle on their backlog and it is an important figure for you to generate.

How much work you would be allowed to have done to get your plant up to a reasonable level of maintenance.

MR. O'NEIL, UNIVERSITY OF OKLAHOMA: I would like to hear you comment on this problem. We do very good scheduling of our routine maintenance etc. Would you comment on what the reaction would be to those requisitions we have for research projects that are not considered maintenance, like remodelling, that we cannot schedule and everyone of them are considered emergencies.

MR. LEWIS: I would say I have an answer. You take the total block of men that you have in the department and you have to find out which men are available to work on work tickets, you subtract service and the people who are on leave, you have to subtract the men for small ticket jobs and you have to subtract the people for maintenance inspection, and what is left is scheduled for major jobs and alteration jobs. Of the people available to work on major jobs or alteration jobs, you schedule these people 50 to 75% on a firm basis, leaving about 25% to work on urgent jobs. Do not schedule your total work force to work until you know how your emergencies are running.

MR. LAUDIERI, UNIVERSITY OF CONNECTICUT: We have started a production control centre. We have broken down into three areas, larger individual jobs, minor individual jobs and jobs under 16 hours. I notice that you are using smaller jobs of 8 hours. Is there any reason?

MR. LEWIS: I think because the standards I mentioned are based on 8 hours.

MR. LAUDIERI, UNIVERSITY OF CONNECTICUT: Do you have a form on what elements you would include in a management report that would go through your production control centre?

MR. LEWIS: It depends on who you want to send the report to. You may be interested in knowing how the men are doing on a per work hour basis and I would have the report set up work hour by work hour.

QUESTION: Do you recommend logging these jobs under 8 hours?

MR. LEWIS: I would recommend writing them on a form with a duplicate copy and the duplicate would be retained in the control centre until the original is brought back and signed by the foreman.

MR. WALDEN, GRINNELL COLLEGE: We have a control but we have a problem recently. We are getting so many requests for expeditory demands. What we have done is to put these into the work area scheme and schedule them for completing in the same way as a job. I would like you to comment on this practice of scheduling estimated jobs?

MR. LEWIS: I believe it is an exercise for the control group. It takes up estimated time but I would go to the trouble of scheduling unless you know it is going to be done.

MR. WILLIAMS, UNIVERSITY OF NEW MEXICO: In your scheme, how many men would you advocate under a non-working foreman.

MR. LEWIS: In the skilled trades, that is electricians, etc., I would have one foreman for every 10 - 15 men, and unskilled, one for every twenty.

MR. ARMOUR: Thank you very much, Mr. Lewis.

MANAGING THE SMALL TICKET JOB (UP TO 8 MANHOURS)

By B. T. Lewis, Management Consultant.

Paint vs. projectors; carpenters' wages vs. teachers' salaries; needs vs. rescurces - these are the annual conundrums of school trustees and educational administrators. The yearly cycle of preparing, justifying and using the college expense budget highlights the constantly increasing cost of educating our youth. Since 1957, the average cost of providing maintenance, operations, and transportation services for schools has risen some 44%. In considering these figures, you college and university physical plant administrators should not get the impression that schcol administrators are in some way unique in reigning over ever-increasing plant costs. A quick reference to an index of plant maintenance costs will show a steady 5% per year erosion of the available maintenance dollars in industrial plants.

The important thing about these statistics is that the better college and university physical plant manager-and I use the word manager deliberately in order to denote the essential characteristics of a physical plant administrator's functions-have shown their Presidents and Boards of Trustees a better-than-average record in keeping down plant costs. You have not sacrificed essential services or built into the plant a backlog of deferred maintenance which would require large capital expense outlays at some future date. Those schools spending in the highest ten percentile for maintenance, transportation, and plant operational services spent some 81% more than the average. This does not mean that those top percentile spenders are profligate with the school's dollars. It does mean that their plant expense budget should be examined in detail to determine if economies can be budgeted (and achieved) by use of modern maintenance management and operational cost control techniques.

Perhaps at this point the topic of this presentation could be changed to "The Use of Scientific Management Principles in Managing the Small Ticket Job" because management, per se, is only a part of a balanced, sophisticated program. First we should define what we are trying to accomplish in this regard and then bring together the elements which facilitate this goal.

The objective for accomplishment of small ticket jobs, which usually account for approximately 70-80%, of the workload volume at a school, is the least possible cost consistent with acceptable quality and proper timing. How successful we are in achieving this objective depends upon how astute we are in bringing together all of the means at our disposal relating to the problem. The two elements of scientific management available to reduce costs in this functional work area are "Work Measurement" and "Work Order Processing".

Work Measurement is merely a technique for establishing a time value for a given amount of work under average conditions. It is usually broken down into standard minutes and standard hours. For example, the standard time for repairing or replacing a fluorescent light fixture might be 1.0 hours. Thru the judicious use of such standards we can predetermine the entire manhour content of any given job with a reliability of ± 5%. This is known as job estimating. From this data we then build individual worker scedules and thereby insure an equitable distribution of work among the maintenance staff. This is an important morale factor, for as you know, there is nothing worse than having people feel they have been assigned too much work in comparison to others. It is equally as bad to have others assigned too little work, for obvious reasons. More important however, is the fact this provides management with a yardstick with which to determine worker productivity. If a man is assigned 400 standard minutes of work during his shift, after making allowances for make-ready, put-away and travel time, but only completes 320 standard minutes or takes 100 aditional minutes to complete his assignment; we say that he is performing at 80% of standard. If you have a merit pay plan then this man, if he performs consistently at this level, should not be paid at the same rate as another man who consistently performs at 100% of standard or higher.

Small ticket jobs (up to 8 Manhours) called emergency or service work could easily comprise 70-80% the total shop force workload. Generally speaking, this is the most expensive way to accomplish this type work since overhead costs are high in proportion to productive time. Also, it is virtually impossible to exercise detailed supervision on this type work since the workers must be mobile. However, the size of the work is very small and any controls exercised must be in proportion to the expected gains. Attached are samples of repetitive job standards for small ticket type work that have been successfully used for control and performance evaluation purposes. These standards are based upon time study and where applicable include a maximum round-trip allowance equivalent to .16 hours leveled time. These standards can be expanded to cover all work done at a school.

Work Order Processing for small ticket jobs covers the use of the colleges and university's work order form for processing emergency or service work; the work classifications normally assigned to small ticket jobs. Emergency work requires immediate action to accomplish any or all of the following purposes:

1. Prevent loss or damage to property.

2. Restore essential services that have been disrupted by a breakdown of utilities.

3. Eliminate hazards to personnel or equipment.

Service work is work that is relatively minor in scope, is not emergency work by nature, and does not normally exceed a cost of $100. Emergency and/or service work should be processed as described in the attached procedure chart.

In closing, I would like to point out that what we have examined in the foregoing are nothing more than management tools. As you know, any tool can be abused or misapplied by an unqualified workman or supervisor. These management tools are no exception and you run the additional risk of discrediting the tool if it is misapplied and the results turn out badly. So let me caution you to be sure you thoroughly understand their use and how to interpret the results before plunging. In other words - look before you leap.

PROCESSING EMERGENCY OR SERVICE WORK AUTHORIZATIONS.

MAINTENANCE CONTROL GROUP	MAINTENANCE SHOPS	ACCOUNTING OFFICE
SETTING UP ACCOUNTS		
1. Prepare Standing Work Orders under separate numbers for each expenditure account to which it is anticipated that Emergency or Service Work may be charged.		
2. Sends original copy to the accounting office and retains one copy.		3. Receives Standing Work Order.
		4. Establishes a Cost Summary Card for each Standing Work Order

PROCESSING AUTHORIZATIONS		
1. Receives request (by oral request (by telephone (by written request		
2. Screens request for adequacy of information and that requested work conforms to school policy.		
3. Prepares Work Order Form in duplicate, recording brief description, appropriate.		

Work Order Number from Standing Work Order List, and assigns fob standard in manhours.

4. Forwards Copy No. 1 to Maintenance Shops (Emergency expediting can be accomplished by telephone authorisation of work, followed by written authorization)

6. Receives autorization; assigns personnel to job.

7. Upon completion of the job, the worker indicates on the Form the date and hour work was started, date and hour work was completed, gives a concise description of exactly what work was done, and signs.

8. Supervisor reviews start and completion time in relation to work accomplished fills in manhours used, and signs. Takes corrective management action as required.

9. Returns Form to Maintenance Control Group for review

10. Matches Copy No. 1 with copy No. 2, destroys Copy No. 2.

11. Holds Copy No. 1 for analysis purposes, then destroys. Takes corrective management action as required.

REPETITIVE JOB STANDARDS

CARPENTRY

CODE	ITEM	KIND	WORK	UNIT	STD. HRS PER UNIT
101	Blade	Saw, planet, etc.	Sharpen	Blade	0.5
102	Blind	Venitian	Repair	Blind	1.4
103	Board, Backing	All	Inst/Relocate	Ea	0.6
104	Box	All	Make	Ea	1.9
105	Bracket	Fire Exting.	Hang/Rehang	Ea	0.6
106	Brush	Buffer	Alter/Adjust	Ea	0.5
107	Bulkhead	All	Repair Hole	Job	1.0
108	Bulletin Board	All	Make/Install	Ea	1.2
109	Bulletin Board	All	Replace Glass	Ea	0.9
110	Caulking	Roof/Window Seams	Caulk	Job	2.9
111	Ceiling Tile	All	Repair/Replace	Job	1.0
112	Cement	All	Inst/Remove Repair	Job	2.9
113	Chair	Misc.	Repair	Chair	1.9
114	Closer	Door	Repair	Closer	2.0
115	Closer	Door	Install	Closer	2.0
116	Cord	Window Sash	Replace	Window	0.3
117	Crash Bar	Door	Inst/Rep/Repl	Door	2.0
118	Covers, air vent	Cellar	Install	Job	2.1
119	Desk	Office	Repair	Desk	1.0
120	Door	Overhead	Repair	Ea	1.7
121	Door	Locker	Adjust	Door	0.6
122	Door	Except O'Head	Repair	Ea	1.2
123	Door	Except O'Head	Install	Door	6.0
124	Door	Wooden, All	Remove/Replace	Door	0.6

REPETITIVE JOB STANDARDS

ELECTRICAL

CODE	ITEM	KIND	WORK	UNIT	STD HRS PER UNIT
101	Antenna	TV	Adj/Repair	Job	2.0
102	Ballast	Fluor.Lits	Replace	Ea	1.3
103	Bell	Misc.	Repair	Job	0.9
104	Box	Junction	Repair	Box	0.4
105	Buffer	Floor	Repair	Buffer	0.9
106	Buzzer	All	Repair	Buzzer	1.4
107	Buzzer System	All	Install	Job	3.2
108	Battery Charger	All	Repair	Charger	1.1
109	Coffee Maker"	All 2/3 Burner	Repair	Ea	0.8
110	Cord	Extension	Make	Ea	0.7
111	Cord	All	Repair/Replace	Ea	0.5
112	Compressor	Air	Repair	Ea	0.9
113	Conduit	Electric	Install	Job	4.6
114	Door	O'Head	Ck/Repair	Job	1.1
115	Door	Hangar	Repair	Job	0.9
116	Elevators	Misc	Repair	Job	0.4
117	Equipment	Misc. Small	Repair	Piece	0.8
118	Fan	Exhaust/Sp.Heater	Clean/Repair	Fan	1.2
119	Fire Alarm System	All	Reset Trans.	Job	1.5
120	Fire Alarm System	All	Ck/Repair	Job	1.2
121	Fixture	Fluor. Lits	Install	Ea	1.6
122	Fixture	Fluor. Lits	Repair/Replace	Ea	1.0
123	Fixture	Incand	Install	Ea.	1.3